DERMAL BONES OF PARAMYLODON FROM THE ASPHALTUM DEPOSITS OF RANCHO LA BREA, NEAR LOS ANGELES, CALIFORNIA.

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In the excavations conducted by the Department of Palæontology of the University of California in the Pleistocene asphaltum deposits at Rancho la Brea, near Los Angeles, large numbers of small bones have been found, resembling closely the dermal ossicles described by Dr. A. Smith Woodward (2, 3) from a piece of the skin of a gravigrade edentate, *Grypotherium listai,* found in a cave at Last Hope Inlet, Patagonia, and also resembling the previously known dermal bones of *Mylodon* (1).

In the asphaltum, two edentates have been found so far, one apparently related to *Megalonyx* and the other referable to the genus *Paramylodon.* As dermal bones, among the Gravigrada, are known only in the Mylodontidæ, there is every reason to regard those presently to be described as pertaining to *Paramylodon.* Comparison of a skull and jaw from the asphalt with the figures of *P. nebrascensis* Brown (4) from the Pleistocene locality of Hay Springs, Nebraska, seems to indicate that they should be referred to this species.

In a preliminary paper on the Rancho la Brea deposits, Professor Merriam (5) says, regarding the discovery of ossicles:

> During the first examination of the beds several small, pebble-like bones were obtained which resembled the dermal ossicles of the ground-sloth, *Grypotherium,* recently described by Dr. A. Smith Woodward from skin fragments obtained in a cave at Last Hope Inlet, Patagonia. The ossicles were in association with remains of a large ground sloth somewhat similar to *Mylodon* in foot structure. Realizing that the peculiar conditions of accumulation offered an especially favorable opportunity for preservation of the dermal armor of a ground-sloth, during the second study of the deposits an attempt was made to find a specimen in which the armor might be recognized. Several hundred yards from the location of the first specimen, a large scapula

resembling that of a mylodont was found partly exposed, with a row of small ossicles immediately over the outer side. The section of the bed containing these bones has recently been worked out, and the row of small bones proves to be the edge of a distinct layer including between 250 and 300 individuals. They mantle over the outer surface of the scapula, being removed from it by about an inch of asphalt.

The layer of bones as we find it has probably been disturbed somewhat and does not occupy its original position exactly, but the fact that it remains as a distinct layer with a tendency toward similar orientation of the individual ossicles indicates that the disturbance has not been great. As the position of the layer in the asphalt was nearly vertical, the presence of the large number of ossicles together may not be attributed to the washing together of scattered elements on the floor of a small basin of deposition.

The ossicles are not closely pressed together and are not superimposed. The individuals range in size from a cross-section of 6.5×4.5 mm. to 21×16 mm. Excepting a few of the largest ones, which are nearly square, the greater number are rounded and rather irregular in form. The outer side is in some cases more regularly modeled than the inner. The surface of the bones is somewhat roughened or pitted in some instances, but no markings are present which would be considered as definite sculpturing. The microscopic structure has not yet been examined.

In general the form, size and arrangement of the ossicles are much as in the bones in the *Grypotherium* skin from Patagonia. The skin fragment first described by Woodward was thought to represent mainly the region of the neck and shoulder. The Californian specimen mantles over the outer side of the scapula, and is presumably not far removed from its original position with relation to this bone.

Subsequent investigation has added little to this, so far as the localization of particular types of ossicles is concerned. Some idea of the diversity of forms assumed by them may be gathered from the accompanying figure, in which several of the types mentioned in the citation may be recognized (especially in Fig. 1, *b, c, d, g* and *h*), nor do these differ essentially from the great mass of scattered and unlocated ossicles. Pitted and smooth forms occur in the same individual. In some of the bones, except for minor undulations and the pores for the entrance of blood vessels, the outer surfaces are smooth and polished (Fig. 1, *e, f*). Others show a highly irregular pattern of small anastomosing ridges (Fig. 1, *b*), but, as previously noted, there is no constancy or regularity in the pattern. Grooves cut across some of the ossicles, as shown in the figure. Some of these may be due to the fusion of two adjacent elements, as suggested by Woodward for the origin of a similar structure in *Grypotherium*.

Thin sections of the ossicles of *Paramylodon* were submitted to Professor E. G. Conklin who has kindly examined them and furnished the following note:

Histological Character of Dermal Bone, Horizontal and Vertical Sections.—Penetrated by many canals for blood vessels, which, in general, begin perpendicular to the surface but soon branch repeatedly and frequently anastomose. Occasionally Haversian systems of lamellæ and lacunæ may be seen around these canals, but generally these lamellæ and lacunæ are very irregularly disposed between the canals. One of the most striking features is the presence of bundles of fibres which run in all directions through the bone, making the latter look almost like a woven fabric. These fibres are most abundant in the spaces between Haversian systems.

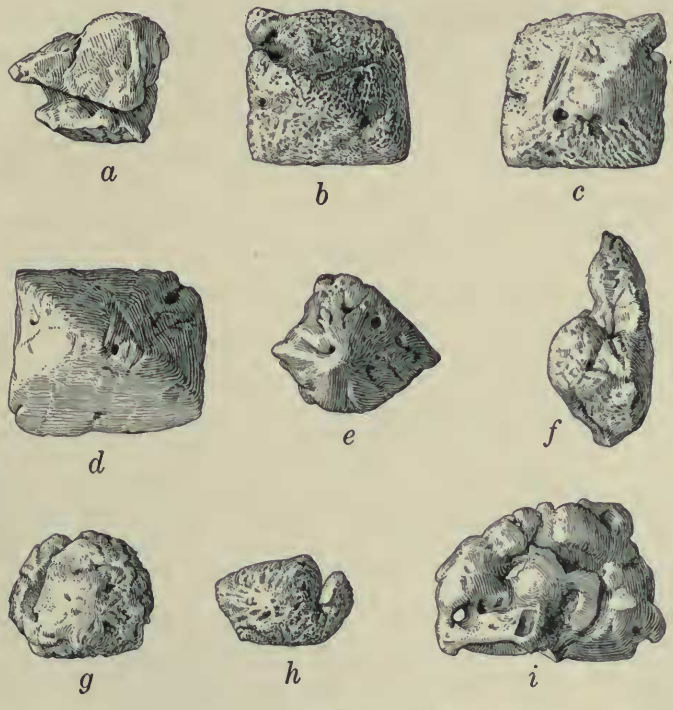

FIG. 1. Dermal ossicles of *Paramylodon nebrascensis* showing some of the various forms assumed. *a*, irregularly shaped ossicle with transverse groove; *b*, *c*, rectangular ossicle with groove toward one corner; *d*, another rectangular bone with pyramidal surface; *e*, *f*, ossicles of irregular shape, similar to some of those found overlying the scapula; *g*, *h*, ossicles of the same character as those overlying the scapula; *i*, pitted ossicle, outer (?) surface. All the figures are one and one half times the natural size.

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Comparison with Woodward's figures of the histological structure of the ossicles in *Mylodon* and *Grypotherium* (2, Pl. xv., Figs. 7, 8) shows a close agreement between the latter and Paramylodon, the only differences appearing in the absence of all suggestion of a zonal arrangement of the lacunæ toward the lateral margin of the bone and the less frequent occurrence of Haversian systems, which are best observable in a transverse section of one of the *Paramylodon* ossicles. In all other respects there is the closest agreement, both in the presence of interlacing fibres traversing the mass, the absence of radiate structure at the periphery, and the development of Haversian systems about the vascular canals, features which are not developed in *Mylodon*.

In addition to the acknowledgments already made, the writer desires to express his indebtedness to Professor J. C. Merriam to whose kindness is due the opportunity to examine and describe this new material.

Princeton University,
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LITERATURE.

Figures in parentheses in the text refer to the titles in this list.

1. **H. Burmeister.**

1864–69. *Anales Museo Publico,* Buenos Aires, Vol. I., p. 173, Pl. V., Fig. 8, 1864–69. Describes and figures the dermal bones of *Mylodon.*

2. **F. P. Moreno and A. Smith Woodward.**

1899. On a Portion of Mammalian Skin, named *Neomylodon listai,* from a Cavern near Consuelo Cove, Last Hope Inlet, Patagonia. By Dr. F. P. Moreno, C.M.Z.S. With a Description of the Specimen by A. Smith Woodward, F.Z.S. *Proceedings of the Zoölogical Society of London,* 1899, pp. 144–156, Pls. XIII.–XV. Describes the skin and ossicles of *Grypotherium.* Figures histological structure.

3. **A. Smith Woodward.**

1900. On some Remains of *Grypotherium* (*Neomylodon*) *listai* and Associated Mammals from a Cavern near Consuelo Cove, Last Hope Inlet, Patagonia. *Proceedings of the Zoölogical Society of London,* 1900, pp. 64–78, Pls. V.–IX. Additional figures of the ossicles.

4. **Barnum Brown.**

1903. A New Genus of Ground Sloth from the Pleistocene of Nebraska. *Bulletin of the American Museum of Natural History,* Vol. XIX., Article XXII., pp. 569–583, Pls. L., LI., 1903. Defines the genus *Paramylodon.*

5. **J. C. Merriam.**

1906. Recent Discoveries of Quaternary Mammals in Southern California. *Science*, N.S., Vol. XXIV., No. 608, pp. 248–250, August, 1906. Describes the discovery of dermal ossicles in the asphaltum.

6. **J. C. Merriam.**

1908. Death Trap of the Ages. *Sunset Magazine*, Vol. XXI., No. 6, pp. 465–475, October, 1908. Figure of the ossicles as found in a sheet of asphaltum overlying the scapula of *Paramylodon.*